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AUTHOR Varantola, Krista
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ABSTRACT

The results of a study of chain compounds, heavily modified noun phrase structures, used in the language of three engineering journals are presented. The findings conlude that: chain compounds appear to be more common in American than British English; chain compounds can be classified in several groups according to their structure, the most common being the noun group (e.g., lap-and-shoulder strap) and the preposition/adverb + noun group (e.g., through-the-lens viewfinder). No systematic rules of metamorphosis are apparent for compound formation, but the tendency is toward simpler forms with minimal closed-system items. Their word class status seems to be somewhere between nominal and adjectival, and when used with other premodifiers, they usually appear closest to the head. They can be characterized roughly as either concrete or figurative expressions. These forms are generally self-explanatory, and may serve to disambiguate and condense information. In contrast to chain compounds used in other fields, such as advertising, engineering chain compounds appear tc serve a special communicative purpose of clarifying and differentiating where a shorter term could be ambiguous. (MSE)

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Krista Varantola
The English Department
University of Turku

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AN ASPECT OF TERM-FORMATION IN ENGINEERING ENGLISH

It is well-known that engineering English (EE) is fond of heavily modified noun-phrase structures, especially heavy premodification. In this context I shall not discuss the possible reasons for this stylistic phenomenon but instead try to describe one particular word/term-formation type within premodification forms in EE, a type that I have called chain compound e.g. end-of-scan output, in-line piston pump, hold-steady-speed facility.

Statistically speaking, Quirk et al. (1972:934) have pointed out the sensitiveness of noun-phrase structures as style markers and the great proportion of complex noun phrases in scientific writing (embracing both science & technology). According to Godfrey (1965:101 ff.) there are about 147 nominal groups in scientific textbooks for about 100 groups in fiction. Both of these observations are based on the Survey of English Usage. Sager et al. (1980:234) refer to several studies and conclude that nouns account for 44% of special language words as against 28% in general language. They also point out that multi-word terms are much more general in special languages than in general language.

Chain compounds come into the picture in that they, too, seem to be a handy device in the process of technical term-formation and they are on the increase in general as well. Their word status is often doubtful, especially when they are ad hoc forms or not yet established forms. As expressions they can be placed somewhere between syntax and lexis, and at the coining stage they can be considered word units only if they are used in premodification. If used in postmodification they are syntactic collocations e.g. depth-to-average-width fusion zone, no-load optical sensing vs. fusion zone measured from its depth to its

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average width or optical sensing with no load? The word status is usually shown through the use of hyphens in premodification. If the expression is reasonably well-established, hyphens are used also in postmodification or independent usage e.g. line-to-line, know-how, on-line, off-screen, line-of-sight, state-of-the-art.

The material. The material for this paper is part of a larger corpus of chain compound structures in present-day English journalism both in British English (BE) and in American English (AE) (Varantola 1981) - altogether 2131 occurrences of which 508 (24%) are from engineering publications (BE: Engineering and The Engineer representing general engineering and AE: IEEE Spectrum representing electronics).

Journalism is naturally favourable to linguistic innovation and this is probably why chain compounds could be easily found even in the technical subset although e.g. Gerbert (1970:68) claims that EE is conservative and not fond of bold word-formation.

In the engineering publications 70% of occurrences were considered to be terms, which, I think, indirectly shows their usefulness for technical and terminological purposes. Admittedly it is difficult and perhaps arbitrary at times to define when an expression of this kind has reached term status. Obtaining a dictionary entry is a slow process and naturally special engineering terms very seldom get an entry in a general dictionary. Some of the technical chain compounds could be found in small glossaries but on the whole no systematic search was carried out. Sager et al. (1980:233) also discuss the problems encountered in identifying "extended terminological units" and point out that English orthography offers little help - compounds are rarely spelled as one word and hyphenation is haphazard. They also point out that "... it (terminologisation) relies more directly on the users' knowing the appropriate concepts and thus being able to identify them".

General occurrence. On the basis of the corpus chain compounds seem, perhaps expectedly, to be more popular in AE journalism than BE. The phenomenon is so consistent that even the highest figure for BE is lower than the lowest AE figure. The figures were estimated separately for each magazine or subset used.

The highest BE estimate (from the engineering publications) was 0.640 chain compounds/1000 words and the lowest AE estimate (from Fortune) 0.690 ccs/ 1000 w. What is perhaps more interesting is that the engineering publications had the highest proportion of chain compounds in both the BE and AE subcorpora. The figure for Spectrum was 0.850 ccs/1000 w. (In practice e.g. a full two-column page in The Economist has about a thousand words.) The high frequencies in the technical subset again indirectly seem to prove the applicability of chain compounds for terminological purposes, although, it must be pointed out, chain compounds are not a high frequency structure but nevertheless an existing and productive means of word-formation.

Overall structure. Structurally chain compounds fall into several main groups the biggest of which were what could be the noun group and another nominal group consisting of a preposition or adverb + noun. These classes were the largest in both the whole corpus and the technical subcorpus. Some examples from the engineering texts:

Noun group	Prep/Adv + noun group
lap-and-shoulder strap	through-the-lens viewfinder
chain-and-sprocket gear system	in-the-field complaints
loss-of-data failure	in-factory rejects
end-of-scan output	on-load isolators
input-to-ground dating	off-line diagnostics
peak-to-peak amplitudes	
	(In was the most popular preposition in this group)

It is noticeable, however, that the prep/adv + noun group is far more frequent in the technical subset than in the whole corpus. It accounts for about 41% of cases in the BE material and about 28% in the AE material. In the American technical subset noun forms were more frequent (41% vs 25% in the BE engineering publications). In the whole corpus the noun group predominated, 40% vs 24% of prep/adv + noun forms i.e. the American technical corpus closely resembled the structure of the whole corpus. I shall return to the usefulness of the "on-line" type terms later and, for the sake of comparison, point out only a few of their general language equivalents:

behind-the-scenes battle
up-to-the-minute information
off-the-record meeting
round-the-clock affair
after-dinner debate
away-from-home eating
below-ground crime
in-depth insight

Smaller structural categories in the technical data can be illustrated by the following examples:

difficult-to-machine materials
ready-to-use modules
as-cast surface finish
direct-on-line converters
let-go current
push-to-read switch
read-only memory
switch-to-talk channel
track-while-scan systems
no-load speed

If we look at the changes that take place during the metamorphosis from a syntactic postmodification structure to a premodifying term we notice that prepositions and articles, plural 3rd person -s endings can be dropped and often are. On the whole a more compact and economical form is aimed at e. g.

(from) ceramic-to-microwave transmitters
through-(the)-thickness alignment
run(s)-flat safety tyre
seven-segment(s)-plus-decimal-point displays

but also

state-of-the-art
top-of-the-line hardware
over-the-horizon radars

No systematic rules seem to emerge on the basis of the examples. But the tendency is towards simpler forms with as few closed-system items as possible.

The word-class status of premodifying chain compounds is not very clear-cut. They seem to be situated on a scale between nominal and adjectival ends. More nominal types are represented e.g. by expressions like loss-of-coolant accident, speaker-and-amplifier unit, sound-on-sound techniques, the more adjectival end by on-line monitor, dual-in-line package, hard-to-work alloys, but what about store-and-forward systems, read-only memory, track-while-scan systems. Syntactic rules, however, permit fuller adjectivization on an ad hoc basis e.g. through adverb modification virtually use-anywhere strain measuring transducers. In the formation of chain compounds even outrageous methods are possible. The following examples are from a very matter-of-fact feature article in Engineering (Dec. 1976):

Complex systems with potentially unreliable, fail-to-danger elements...
... because spring failure or stem bearing seizure leads to fail-to-danger.
... fail-to-danger can occur...
The essential ingredients of any safety mechanism are reliability, failure-to-safety....
... and the system should fail-to-safety in the event of...

A further structural development that leads to an even more compact form is the formation of acronyms based on chain compounds or chain compounds + other elements e.g. dual-in-line package (DIP) plug-in boards, two more over-the-horizon OTH radars, silicon-on-sapphire (SOS) integrated circuits, 1.5 k bytes of programmable read-only memory (PROM).

Syntactic features. When chain compounds are used together with other premodifiers they are usually placed closest to the head. In the corpus the chain compound was the only premodifier in about 70% of cases but when it was used together with other modifiers it was closest to the head in 76% of cases. There seem to be two reasons for this. Either the chain compound is considered a noun modifier and automatically takes the place closest to the head e.g. a holographic lock-and-key system or, on the other hand, chain compounds are usually restrictive and categorizing rather than descriptive due to their often improvised nature (cf. Quirk et al. 1972:904). Bolinger (1952:1136) thinks that the standardizing function of many chain compounds has actually caused the creation of many items. (His example is under-the-counter sale vs a sale under the counter.) If we look at engineering chain compounds that are not placed closest to the head we find examples of this kind:

above-ground tropical environment
standard off-the-shelf linear integrated circuits
uniform in-plane biaxial direct and shear loads

In these cases the other premodifiers are even more restrictive and classifying and the chain compounds often adjectival in nature.

All noun phrases with chain compounds are basically heavy structures. Thus it is not surprising that these noun phrases usually function as adverbials (36%) or objects (32%) and less commonly as subjects (23%). But it is interesting to note that even fairly lengthy NPs are used in a subject position in

technical language. This is in accordance with the tendency pointed out by Quirk et al. (1972:934) that in scientific writing there is "the weakest association of simple with subject and complex with non-subject". For example

A range of economic, easy-to-operate treatment plants is now available...
The new programmable-read-only memory version of the PDP-8M would suggest...
Foam filling of difficult-to-protect body sections is likely to be on the increase.

Semantic features. Chain compounds can be broadly divided into concrete and figurative expressions i.e. those types where the meaning is easily extractable as "a sum of the parts" and those where the meaning is harder to grasp and requires a deeper analysis. Naturally this dichotomy is not always clear-cut and here again chain compounds seem to be scattered along a scale rather than placed at the two ends. In the whole material about 2/3 were considered concrete. The technical data was understandably even more matter-of-fact in reference (83%) and less convention-flouting than the general types. Some examples:

Concrete and general	Figurative and general
shoot-to-kill order	warts-and-all biography
dial-a-bus experiment	haven't-I-met-you-somewhere routine
no-confidence motions	head-in-the-clouds type
turn-of-the-century chamber	walk-soft course
Concrete and technical	**Figurative and technical**
through-the-lens viewfinder	off-the-shelf component
in-process gauging	merry-go-round rail system
push-to-print recorder	hands-on sessions
in- and out-of-tolerance conditions	know-how gap
leak-before-break safety feature	not-invented-here complex

The purpose and functions of chain compounds. It has often been pointed out that present-day English does not actively utilize native resources in the formation of compounds (cf. Ullmann 1964:105) and that the resulting opaqueness has contributed even to building a language bar between educated and less educated people. Leisi (1955:205-6) among others has suggested that chain compounds could be used to replace "hard words". It is certainly difficult to find contrastive examples

of this method of simplification but perhaps the next example will illustrate the process that could be at work at the creation stage.

More often, it applies a newly evolved technique called "value options in a workshop setting". (Translation: on-the-job interviews and meetings to determine where... (Fortune 25.9.78, p. 94.)

In engineering language, it could be claimed, chain compounds are a means to avoid definitions and terms with little indication of function or content (e.g. no-break inverter modes, out-of-range condition). Chain compound terms are self-explanatory in most cases and thus also a means of disambiguation. They also represent the idea-compression process so common in technical language. In this particular case tight packing of information is achieved through a syntactic and a synthetic compound and, as shown above, sometimes through a further development into an acronym.

It is interesting to note that in the corpus news items in the engineering publications had proportionately more chain compounds than longer articles, which gives further proof of their condensing capacities. English is naturally a nearly ideal language for the development of constructions of this kind. Grammatical endings do not pose any difficulties and new coinages that are basically syntactic collocations are easily fitted as word units into the syntactic pattern.

A further reason for the popularity of chain compounds in engineering language is probably the labelling function of premodifiers (pointed out e.g. by Bolinger 1952:1131, Leech 1966: 140, Leech 1974:37 and Akhmanova 1958:17-18) and the labelling needs of engineering language. In general the pre-head position is reserved for permanent or characterizing modifiers and in technology there is very often need for further restrictive definitions and labels or differentiation. Premodification provides an ideal, if not always aesthetic means for this purpose e.g.

a simple press-to-sound and press-to-silence action
surface-down seismology
direct-on-line, direct-on-line reversing, star-delta, two-speed, auto-transformer and stator-rotor types

In general language chain compounds, especially the most daring coinages are often intentionally vague and permit several interpretations and this fact is naturally exploited in advertising e.g. top-of-the-tree flavour (Leech 1966:139-40) or Ford offers the hates-to-stand still look... (Penttilä 1962:40) but in engineering language this quality of chain compounds is seldom taken advantage of. Rather the opposite is true. Chain compound terms are normally explicit and clear in reference within the special language and special communication purpose. Sometimes they can be seen as a means of further clarification and differentiation where a shorter form could be ambiguous e.g. especially the type on-line. The form with the preposition clarifies the relation between the premodifier and the head of. in-circuit testing vs circuit testing or through-thickness alignment vs thickness alignment.

REFERENCES

Akhmanova, O.S. 1958. "Lexical and Syntactical Collocation in Contemporary English". Zeitschrift für Anglistik und Amerikanistik 6. 14-21.

Bolinger, D.L. 1952. "Linear Modification". PMLA (1952). 1117-1144.

Gerbert, M. 1970. Besonderheiten der Syntax in der technischen Fachsprache des Englischen. Halle.

Godfrey, J.A. 1965. "The Survey of English Usage". ELT 29:3. 98-103.

Leech, G.N. 1966. English in Advertising: A Linguistic Study of Advertising in Great Britain. London.

Leech, G.N. 1974. Semantics. Harmondsworth.

Leisi, E. 1955. Das heutige Englisch, Wesenszüge und Probleme. Heidelberg.

Penttilä, E. 1962. "Advertising English". Mémoires de La Société Néophilologique de Helsinki 1962. 3-62.

Quirk, R., Greenbaum, S., Leech, G. & Svartvik, J. 1972. A Grammar of Contemporary English. London.

Sager, J.S., Dungworth, D. & McDonald, P.F. 1980. English Special Languages. Principles and practice in science and technology. Wiesbaden.

Ullmann, S. 1964. Semantics. An Introduction to the Science of Meaning. 1st ed. 1962. Oxford.

Varantola, K. 1981. Chain Compounds in Present-Day English Journalism. Unpublished licentiate thesis, University of Turku. Turku.